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first and second ends having a plurality of radially spaced, longitudinal slots formed therein, wherein an inner surface of the first and second ends of the connector is threaded and wherein the first and second ends of the connector include a recessed groove; and

an intermediate portion located between the first and second ends having a plurality of radially spaced, longitudinal slots that at least partially overlap the slots formed in the first and second ends,

providing a first and second tubular having overlapping longitudinal slots; and

coupling the sleeve to corresponding threads on an outer surface of the first and second tubular.

#### REMARKS

This is intended as a full and complete response to the Office Action dated July 3, 2001. Claims 1-15 are pending in the application and stand rejected. Applicants have cancelled claims 2 and 7-15 without prejudice. The cancellation of claims 2 and 7-15 is not an admission of non-patentability. Applicants have simply cancelled the claims without prejudice to place the application in condition for allowance. Further, Applicants have amended claims 1 and 3 to correct matters of form and to more clearly define aspects of the invention. Applicants have also added new claims 16-26 to more clearly define the invention. Still further, Applicants have enclosed a substitute specification to correct the informalities addressed by the Examiner and have proposed amendments to Figures 3 and 5. Please enter these amendments and reconsider the claims pending in the application for reasons discussed below.

The specification is objected by the Examiner. Applicants have enclosed herewith a substitute specification along with proposed amendments to obviate the objections. Withdrawal of the objections is respectfully requested.

The drawings are objected to by the Examiner. Applicants have proposed a drawing amendment as discussed above to obviate the objection. Withdrawal of the objection is respectfully requested.

Claims 1, 7-9, 10, 11-13, 14 and 15 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which application regards as the invention. Applicants have amended the claims to obviate the rejections. Withdrawal of the rejections is respectfully requested.

Furthermore, Applicants submit that the terms "deformable fingers of the sleeve" and "overlapping slots" are defined in the specification at least at page 10, line 21 through page 11, line 11 (paragraph 32 of the substitute specification) with reference to Figures 3-4. As shown in Figures 3-4, the "overlapping slots" 64, 65, 66 are radially spaced and at least partially overlap one another. In other words, the slots 64, 65, 66 would superimpose or contact at the ends if the slots 64, 65, 66 were not radially spaced apart. Applicants have proposed additional lead lines for Figures 3 and 4 to more clearly identify the "overlapping slots". Further, a "deformable finger" is the material between the ends of two radially adjacent slots that would overlap were the slots 64, 65, 66 not radially spaced. Withdrawal of the rejection is respectfully requested.

Claims 1-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Lohbeck* (WO 98/22690) in view of *Campbell* (U.S. Patent No. 5,924,745). The Examiner states that *Lohbeck* discloses the claimed invention but fails to teach internal threads for engaging a corresponding thread on an outer surface of the respective tubing end portion. The Examiner states that it would have been obvious to modify *Lohbeck* as taught by *Campbell* to have an internal thread for engaging a corresponding thread on an outer surface for the purpose of a secure connection on expansion of the tubing lengths and the connector. Regarding claim 6, the Examiner states that it would have been obvious to modify *Lohbeck's* conforming grooves to receive corresponding tongues as taught by *Campbell* in order to obtain a secure seal in an expandable slotted tubing.

Applicants respectfully traverse the rejection. *Lohbeck* discloses a sleeve comprising a series of staggered and partially overlapping slots that is arranged coaxially around the ends of adjoining tubulars and fastened to the tubulars using screws or rivets. (See, *Lohbeck* at page 3, lines 9-18.) *Campbell* discloses a connector made

of two parts, one male and one female. The male part is welded to a first tubular and the female part is welded to a second tubular. The male and female parts are then placed together to form a connection. *Campbell* teaches that the male and female parts can be screwed together to form the connection. (See, *Campbell* at col. 3, lines 18-38.) A combination of *Lohbeck* and *Campbell* does not teach, show, or suggest a tubular connector comprising an intermediate portion located between slotted end portions, the connector being radially expandable by deformation of fingers of material in the intermediate portion where adjacent circumferentially spaced slots overlap, and wherein the slotted end portions of the connector are threaded to the ends of respective end portions of the tubing lengths as recited in claim 1 and those dependent therefrom.

Further, the combination of *Lohbeck* and *Campbell* does not teach, show, or suggest a connector threadably disposed between first and second tubulars, wherein the connector comprises an intermediate portion located between first and second ends having a plurality of radially spaced, longitudinal slots that at least partially overlap the slots formed in the first and second ends, as recited in new claims 16, 23, 25, 26, and those dependent therefrom. Still further, the combination of *Lohbeck* and *Campbell* does not teach, show, or suggest threaded inner surfaces of first and second ends of the connector engaging a corresponding thread on an outer surface of a first and second tubular, as recited in new claims 23-26. Accordingly, Applicants respectfully request withdrawal of the rejection and allowance of the claims.

Claim 10 stands rejected under 35 U.S.C. § 102(b) as being anticipated by *Lohbeck* (WO 98/22690). Claims 11 and 12 stand rejected under 35 U.S.C. § 103 as being obvious over *Lohbeck* (WO 98/22690), and further in view of *Akeyson* (U.S. Patent No. 2,858,894). Claim 14 stands rejected under 35 U.S.C. § 102(b) as being anticipated by *Akeyson* (U.S. Patent No. 2,858,894). Applicants have cancelled claims 10, 11, 12, and 14 without prejudice. The cancellation of these claims is not an admission of non-patentability. Applicants have simply cancelled the claims to place the application in condition for allowance and to reserve the right to pursue these claims in a divisional application. Accordingly, withdrawal of the rejections is respectfully requested.

The prior art made of record is noted. However, it is believed that the secondary references are no more pertinent to the Applicants' disclosure than the primary references cited in the office action. Therefore, it is believed that a detailed discussion of the secondary references is not deemed necessary for a full and complete response to this office action. Accordingly, allowance of the claims is respectfully requested.

In conclusion, the references cited by the Examiner, neither alone nor in combination, teach, show, or suggest the claimed invention. Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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## APPENDIX

Paragraph 18 has been amended as follows:

[0018] According to a still further aspect of the present invention there is provided an arrangement for coupling lengths of expandable tubing, the arrangement comprising a longitudinally slotted sleeve, first and second tubing lengths defining overlapping longitudinal slots. In use, [in use] the tubing lengths [being] are radially expandable by deformation of fingers of material where adjacent circumferentially spaced slots overlap, and connecting means for connecting the sleeve to the ends of the tubing lengths.

Paragraph 19 has been amended as follows:

[0019] The sleeve may be in the form of longitudinally extending strips of metal. Most preferably, the strips are rectilinear. On expansion, the strips of the sleeve move radially outwardly and separate circumferentially. Initially, that is prior to expansion, the strips may be circumferentially connected, by frangible links 119 such as wire, webs of material or one or more welds, to facilitate sleeve handling.

Paragraph 31 has been amended as follows:

[0031] From the above description it will be apparent to those of skill in the art that the assembly 14 provides a convenient means for connecting expandable tubing lengths. It is recognized that, for some applications, users may prefer to include coupling means between the connector end portions and the tubing lengths in addition to the thread connection, and in such cases screws, rivets, pins or the like may be provided to extend between the end portions 20, 21 and the tubing lengths [26, 27] 24, 25.

Paragraph 32 has been amended as follows:

[0032] Reference is now made to Figures 3 and 4 of the drawings which will illustrate an arrangement 50 for connecting first and second lengths 52, 54 of expandable tubing utilizing an expandable sleeve 56 secured to the ends of the tubing lengths 52, 54 by screws 58. The tubing walls 60, 61 and the sleeve wall 62 define overlapping longitudinal slots 64, 65, 66. Expansion of the tubing lengths 52, 54 and the sleeve 56 is accommodated by deformation of fingers of material 68, 69, 70 where the slots 64, 65, 66 overlap, and following deformation the slots 64, 65, 66 define diamond-shaped apertures. During expansion there is little or no deformation of the nodes 72, 73, 74 between the longitudinally spaced slots 64, 65, 66, and the screws 58 pass through bores in the endmost nodes 72, 73, 74 of the tubing lengths 52, 54 and the sleeve 56, at the ends of the tubing lengths 52, 54 and sleeve 56. Thus, the endmost deformable fingers 68, 69 of the tubing lengths [68, 69] 52, 54 are axially spaced from the endmost fingers 70 of the sleeve [70] 56.

Paragraph 33 has been amended as follows:

[0033] In use, the tubing lengths 52, 54 and [sleeves] sleeve 56 are shipped in disassembled form. The tubing lengths 52, 54 are made up on surface as the tubing is fed into the bore in which the tubing is to be utilized. In particular, the ends of the tubing lengths 52, 54 are located in the respective ends of the sleeve 56. The screws 58 are then located and tightened in the screw bores. A number of tubing lengths are made up to provide the desired length of tubing and the assembled tubing run into the bore. On reaching the desired location downhole, the tubing is anchored in place, and an expansion cone then pushed or pulled through the tubing. The cone expands the tubing length 52, 54 radially outwards such that, as mentioned above, the slots 64, 65, 66 become diamond-shaped, with the expansion being accommodated by deformation of the fingers 68, 69, 70. The sleeve 56 deforms in a similar manner to the tubing lengths 52, 54. On moving through the arrangement 50, the expansion cone deforms, in turn, the endmost fingers 68 of the first tubing length 52, the fingers 70a at the first end of the

sleeve 56, the fingers 70b at the second end of the sleeve 56, and finally the endmost fingers 69 of the second tubing length 54.

The claims have been amended as follows:

1. (Amended) An expandable tubing assembly comprising:

a tubular connector defining overlapping longitudinal slots and comprising an intermediate portion located between slotted end portions, the connector being radially expandable by deformation of fingers of material in the intermediate portion where adjacent circumferentially spaced slots overlap, and

lengths of expandable tubing defining overlapping longitudinal slots with nodes beyond the ends of the slots and having slotted end portions, the tubing being radially expandable by deformation of fingers of material where adjacent circumferentially spaced slots overlap,

wherein the [connector] slotted end portions of the connector are [being coupled] threaded to the nodes of respective end portions of the tubing lengths and the deformable fingers of the [sleeve being] connector are axially spaced from the end most deformable fingers of the respective tubing lengths.

3. (Amended) The assembly of claim 1 wherein the intermediate portion is of corresponding configuration of the tubing lengths, such that [the] expansion characteristics of the connected tubing assembly are substantially constant [over the connection].

## **EXPANDABLE SLOTTED TUBING STRING AND METHOD FOR CONNECTING SUCH A TUBING STRING**

### **BACKGROUND OF THE INVENTION**

#### **Field of the Invention**

[0001] This invention relates to a connector, and in particular to a connector forming part of an expandable tubing assembly. The invention also relates to a method of connecting lengths of expandable tubing.

#### **Description of the Related Art**

[0002] W093\25800 describes expandable tubing defining overlapping longitudinal slots. On expansion of the tubing, by pushing or pulling a mandrel through the tubing, the slots expand to form diamond-shaped apertures. The expansion is accommodated by deformation of the fingers of metal between the slots, this deformation taking place predominantly at the slot ends, and also by circumferential extension of the parts of the tubing wall beyond the slot ends. In expandable tubing developed by the applicants radial expansion is achieved with the parts of the tubing wall between and beyond the slot ends experiencing little if any deformation, these parts being known as the tubing "nodes".

[0003] Arrangements for connecting lengths of slotted tubing are disclosed in W096\37687 and W097\21901, the disclosures of which are incorporated herein by reference. Both of these documents describe arrangements in which the end of one length of tubing defines a male coupling portion which is received within a female coupling portion on the other length of tubing and attached thereto.

[0004] In another coupling arrangement, the ends of the tubing lengths are received within an external coupling sleeve. However, it has been found that, following expansion, the sleeve contracts radially by a significant extent; this creates a restriction in the bore defined by the tubing.



## **SUMMARY OF THE INVENTION**

[0005] According to the present invention there is provided a method of connecting lengths of expandable tubing defining overlapping longitudinal slots, the method comprising: providing a tubular connector defining overlapping 10 longitudinal slots and comprising end portions; providing lengths of expandable tubing defining overlapping longitudinal slots and having end portions defining nodes between and beyond the ends of the slots and connecting the connector end portions to nodes of respective end portions of the tubing lengths.

[0006] According to another aspect of the present invention there is provided an expandable tubing assembly comprising: a tubular connector defining overlapping longitudinal slots and comprising end portions; lengths of expandable tubing defining overlapping longitudinal slots and having end portions defining nodes between and beyond the ends of the slots; and the connector end portions being; coupled to the nodes of the respective end portions of the tubing lengths.

[0007] The formation of the connections between the connector end portions and the nodes of the tubing end portions provides for a relatively secure connection. Preferably, the connector end portions and the nodes of the tubing end portions are threaded, and the absence of significant deformation at the nodes facilitates maintenance of a secure connection on expansion of the tubing lengths and the connector.

[0008] Preferably also, the connector further comprises an intermediate portion selected to be of corresponding configuration to the tubing lengths, such that the expansion characteristics of the connected tubing assembly will be substantially constant over the connection.

[0009] Preferably also, each connector end portion defines a slot to receive a corresponding tongue provided on the respective tubing length end portion.

[0010] According to a further aspect of the present invention there is provided an expandable tubing assembly comprising: a tubular connector defining overlapping longitudinal slots, the connector comprising end portions and an intermediate portion;

and lengths of expandable tubing defining overlapping longitudinal slots and having end portions coupled to the connector end portions, at least the connector intermediate portion being of corresponding configuration to the tubing lengths, such that the expansion characteristics of the intermediate portion and the tubing lengths correspond.

[0011] This aspect of the invention provides a connector which expands in a compatible manner to the adjacent tubing and thus facilitates reliable expansion of an expandable tubing string.

[0012] According to still further aspect of the present invention there is provided an arrangement for coupling lengths of expandable tubing, the arrangement comprising a sleeve defining overlapping longitudinal slots, first and second tubing lengths defining overlapping longitudinal slots, in use the sleeve and tubing lengths being radially expandable by deformation of fingers of material where adjacent circumferentially spaced slots overlap, and connecting means for connecting the sleeve to the ends of the tubing lengths, the deformable fingers of the sleeve being axially spaced from the endmost deformable fingers of the respective tubing lengths.

[0013] In use, on expansion of the tubing lengths and the sleeve, the deformation of the sleeve fingers will take place following the deformation of the endmost fingers of the first tubing length and prior to the deformation of the endmost fingers of the second tubing length. It has been found that, following expansion, there is little or no diametrical shrinkage of the sleeve, and the force necessary to expand the coupled tubing ends is approximately half that required to expand tubing ends coupled with a sleeve in which there is substantial overlap between the sleeve and the tubing ends.

[0014] The invention also relates to a method for coupling the ends of first and second lengths of expandable tubing defining overlapping longitudinal slots and deformable fingers of material where adjacent circumferentially spaced slots overlap, the method comprising the steps of: providing a sleeve defining overlapping longitudinal slots and deformable fingers of material where adjacent circumferentially spaced slots overlap; coupling the sleeve to the ends of first and second lengths of expandable tubing such

that the fingers of the sleeve are longitudinally spaced from the endmost fingers of the tubing lengths; and forcing an expansion member through the connected tubing lengths to expand the sleeve and tubing lengths.

[0015] As used herein, the term slots is intended to encompass slots which extend through the walls of the sleeve and tubing, slots which extend only part way through the walls and any other appropriate weakening of the walls such as lines of bores or scallops.

[0016] Preferably, the connecting means are provided at circumferentially spaced locations at the end of the tubing lengths beyond the endmost tubing fingers, and at the ends of the sleeve beyond the respective endmost tubing fingers. The connecting means may comprise pins, rivets, screws and the like for location in appropriate aligned bores provided in the sleeve and tubing lengths. Single fasteners may be provided beyond each tubing finger, or multiple fasteners may be provided.

[0017] Preferably also, the unexpanded sleeve is of larger diameter than the tubing lengths. Most preferably, the sleeve and the tubing length are each of substantially constant diameter along their length.

[0018] According to a still further aspect of the present invention there is provided an arrangement for coupling lengths of expandable tubing, the arrangement comprising a longitudinally slotted sleeve, first and second tubing lengths defining overlapping longitudinal slots, in use the tubing lengths being radially expandable by deformation of fingers of material where adjacent circumferentially spaced slots overlap, and connecting means for connecting the sleeve to the ends of the tubing lengths.

[0019] The sleeve may be in the form of longitudinally extending strips of metal. Most preferably, the strips are rectilinear. On expansion, the strips of the sleeve move radially outwardly and separate circumferentially. Initially, that is prior to expansion, the strips may be circumferentially connected, by frangible links such as wire, webs of material or one or more welds, to facilitate sleeve handling.

[0020] The invention further relates to a method for coupling the ends of first and second lengths of expandable tubing defining overlapping longitudinal slots and deformable fingers of material where adjacent circumferentially spaced slots overlap, the method comprising the steps of: providing a sleeve comprising longitudinally extending strips of material; coupling the sleeve to the ends of first and second lengths of expandable tubing; and forcing an expansion member through the connected tubing lengths to expand the sleeve and tubing lengths.

[0021] Preferably, the connecting means are provided at circumferentially spaced locations at the end of the tubing lengths beyond the endmost tubing fingers, and at the ends of the sleeve. The connecting means may comprise pins, rivets, screws and the like for location in appropriate aligned bores provided in the sleeve and tubing lengths. Single fasteners may be provided beyond each tubing finger, or multiple fasteners may be provided.

[0022] Preferably also, the unexpanded sleeve is of larger diameter than the tubing lengths. Most preferably, the sleeve and the tubing length are each of substantially constant diameter along their length.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0023] Aspects of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a sectional view of a length of expandable tubing, shown in an expanded configuration;

Figure 2 is a sectional view of an expandable tubing assembly in accordance with a first embodiment of the present invention;

Figure 3 is a schematic plan view of an arrangement for coupling lengths of expandable tubing in accordance with a second embodiment of the present invention;

Figure 4 is a sectional view of Figure 3; and

Figure 5 is a schematic plan view of an arrangement for coupling lengths of expandable tubing in accordance with a third embodiment of the present invention.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

[0024] Reference is first made to Figure 1 of the drawings, which illustrates a length of expandable tubing 10. In its initial configuration, the tubing 10 is simply a length of pipe in which a series of longitudinal slots 12 have been machined. Applying a radially outward force to the tubing wall, by passing a mandrel through the tubing, causes the tubing to expand such that the slots 12 become diamond-shaped openings.

[0025] The tubing 10 is supplied in lengths suitable for transportation and handling and these are joined to one another on surface to create a tubular string. The assembly 14 illustrated in Figure 2 of the drawings allows lengths of expandable tubing 10 to be connected to form a string, as will now be described.

[0026] The assembly 14 comprises a tubular connector 16 defining overlapping longitudinal slots 18, the connector 16 comprising end portions 20, 21 and an intermediate portion 22. The slots 18 extend over the whole length of the connector 16, but the only slot overlap occurs in the intermediate portion 22.

[0027] The connector 16 is utilized to join the ends of two lengths of expandable tubing 24, 25, the ends of which are adapted to engage with the connector end portions 20, 21 as described below.

[0028] The connector intermediate portion 22 is of substantially the same wall thickness as the tubing 24, 25, however the connector end portions 20, 21 are upset, that is they include portions of greater wall thickness than the tubing 24, 25 and are of a greater diameter than the tubing 24, 25. The inner walls of each connector end portion 20, 21 define threads 26, 27 for engaging corresponding threads 28, 29 on the outer surface of the tubing 24, 25. Inwardly of the threads 26, 27 the end portions 20, 21 define grooves 30, 31 to receive corresponding tongues 32, 33 provided on the ends of the tubing lengths 24, 25.

[0029] As noted above, the connector slots 18 only overlap in the intermediate portion 22, such that on expansion of the connector 16 and the tubing lengths 24, 25 the connector 16 is only subject to significant deformation in the intermediate portion 22, at

and adjacent the slot overlap 34. The amount of deformation is substantially lower in the rest of the connector 16, particularly in the "nodes" 36 between the ends of the longitudinally aligned slots 18. The tubing lengths 24, 25 feature nodes 38 between and beyond the ends of the tubing slots 12 and the tubing threads 28, 29 are formed on the end most tubing nodes.

[0030] In use, the tubing lengths 24, 25 are connected by first making up the connector 16 to one tubing length 24, and then making up the second tubing length 25 to the other end of the connector 16. A number of tubing lengths are connected in this way to form a tubing string, which is run into a wellbore. Once in a desired position, an expansion mandrel is run through the tubing string, and radially extends the connector 16 and the tubing lengths 24, 25. In doing so, the connector slots 18 and tubing slots 12 are expanded to define diamond shaped openings, as are illustrated in Figure 1. As described above the connector is only subject to substantial deformation at the slot overlaps 34, such that the metal of the slot end portions 20, 21 is subject to minimal deformation. As the deformation of the metal of the connector occurs primarily in the intermediate portion 22, which is of corresponding diameter and thickness to the tubing 24, 25, the expansion properties of the connector 16 are similar to the tubing 24, 25, such that the connector 16 and tubing lengths 24, 25 will expand in corresponding and predictable manner, minimizing the occurrence of irregularities in the internal diameter of the expanded tubing string.

[0031] From the above description it will be apparent to those of skill in the art that the assembly 14 provides a convenient means for connecting expandable tubing lengths. It is recognized that, for some applications, users may prefer to include coupling means between the connector end portions and the tubing lengths in addition to the thread connection, and in such cases screws, rivets, pins or the like may be provided to extend between the end portions 20, 21 and the tubing lengths 26, 27.

[0032] Reference is now made to Figures 3 and 4 of the drawings which will illustrate an arrangement 50 for connecting first and second lengths 52, 54 of expandable tubing utilizing an expandable sleeve 56 secured to the ends of the tubing lengths 52, 54 by

screws 58. The tubing walls 60, 61 and the sleeve wall 62 define overlapping longitudinal slots 64, 65, 66. Expansion of the tubing lengths 52, 54 and the sleeve 56 is accommodated by deformation of fingers of material 68, 69, 70 where the slots 64, 65, 66 overlap, and following deformation the slots 64, 65, 66 define diamond-shaped apertures. During expansion there is little or no deformation of the nodes 72, 73, 74 between the longitudinally spaced slots 64, 65, 66, and the screws 58 pass through bores in the endmost nodes 72, 73, 74 of the tubing lengths 52, 54 and the sleeve 56, at the ends of the tubing lengths 52, 54 and sleeve 56. Thus, the endmost deformable fingers of the tubing lengths 68, 69 are axially spaced from the endmost fingers of the sleeve 70.

[0033] In use, the tubing lengths 52, 54 and sleeves 56 are shipped in disassembled form. The tubing lengths 52, 54 are made up on surface as the tubing is fed into the bore in which the tubing is to be utilized. In particular, the ends of the tubing lengths 52, 54 are located in the respective ends of the sleeve 56. The screws 58 are then located and tightened in the screw bores. A number of tubing lengths are made up to provide the desired length of tubing and the assembled tubing run into the bore. On reaching the desired location downhole, the tubing is anchored in place, and an expansion cone is then pushed or pulled through the tubing. The cone expands the tubing length 52, 54 radially outwards such that, as mentioned above, the slots 64, 65, 66 become diamond-shaped, with the expansion being accommodated by deformation of the fingers 68, 69, 70. The sleeve 56 deforms in a similar manner to the tubing lengths 52, 54. On moving through the arrangement 50, the expansion cone deforms, in turn, the endmost fingers 68 of the first tubing length 52, the fingers 70a at the first end of the sleeve 56, the fingers 70b at the second end of the sleeve 56, and finally the endmost fingers 69 of the second tubing length 54.

[0034] In testing it has been found that the forces required to expand the connecting arrangement 50 are the same or only slightly higher than the forces required to expand the tubing lengths 52, 54. Also, the expanded sleeve 56 tends to retain its expanded form, and suffers little or no diametrical shrinkage after the expansion cone has passed

through the sleeve 56. Thus, the present invention avoids the difficulties experienced with previously proposed sleeve connectors. Further, the connection arrangement 50 is less expensive to produce than the male/female connectors as described in W096/37687 and W097/21901.

[0035] Reference is now made to Figure 5 of the drawings, which illustrates an alternative arrangement 110 for connecting first and second lengths 112, 114 of expandable tubing utilizing an expandable sleeve 116 secured to the ends of the tubing lengths 112, 114 by screws 118. The tubing walls define overlapping longitudinal slots 124, 125. However, unlike the first described embodiment, the sleeve wall is formed of individual longitudinally extending strips 126. Expansion of the tubing lengths 112, 114 and the sleeve 116 is accommodated by deformation of fingers of material 128, 129 where the slots 124, 125 overlap, and circumferential separation of the sleeve strips 126. Following deformation the slots 124, 125 define diamond-shaped apertures. During expansion there is little or no deformation of the nodes 132, 133 between the longitudinally spaced slots 124, 125, and the screws 118 pass through bores in the endmost nodes 132, 133 of the tubing lengths 112, 114 and the ends of the sleeve strips 126.

[0036] It will further be apparent for those of skill in the art that the above-described embodiment is merely exemplary of the present invention, and that various modifications and improvements may be made thereto, without departing from the scope of the present invention.



## ABSTRACT OF THE DISCLOSURE

[0037] An expandable tubing assembly comprises a tubular connector defining overlapping longitudinal slots, the connector comprising end portions and an intermediate portion. The slots extend over the whole length of the connector, but the only slot overlap occurs in the intermediate portion. The assembly further comprises lengths of expandable tubing defining overlapping longitudinal slots and having end portions defining nodes between and beyond the ends of the tubing slots. Tubing threads are formed on the end most tubing nodes. The connector end portions define threads and are coupled with the threads formed on the nodes of the respective end portions of the tubing lengths.